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13. ABSTRACT *(Maximum 200 words)*

Dr Tony Grange was supported by the AASERT grant until his graduation in 1995, when he took a Postdoctoral position at the University of Conneticut Medical Center. Dr grange work on the topic of binaural pitch, sometimes called Huggins pitch. He showed that this pitch, while mediated by purely binaural comparisons behaved in many ways similar to traditionally derived monaurla pitches. For instance, he showed that the one dichotic pitch can "mask" another pitch if the two have similar pitch values. But. he alos showed that dichotic pitches were influenced by spectral energy in far removed spectral regions in ways that monaural pitches are not. He developed a cross-correlation model to account for many of these dichotic pitch data. In this model, there is a wideband prefilter which appears consistent with other studies of binaural processing.

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ASSERT Final Report-Sept. 1993 -- Aug 1996

AFOSR GRANT:F9620-93-1-0469

Principal Investigator: William A. Yost, PhD, Parmly Hearing Institute, Loyola University Chicago, Chicago IL, 60626. **Students:** Tony Grange (1993-94); Sandra Guzman (1994-96)

ASSERT **Final Progress Report** - August 1996

AFOSR GRANT:*F9620-93-1-0469*

Principal Investigator: William A. Yost, PhD, **Students:**Tony Grange (1993-94); Sandra Guzman (1994-96)

Objectives: To better understand the role of binaural processing in complex multi-sound source acoustic environments.

Status of Effort:

a) Support received from AFOSR Grant Number F49620-93-j-0489.

b) No graduate students supported from Grant F49620-93-j-0489 prior to 1993.

c) No graduate students supported from Grant F49620-93-j-0489 from 1993 o 1996

d) One graduate student, Tony Grange, was supported by the ASSERT grant in academic year 1993-94, and one Student, Sandra Guzman, was supported by the ASSERT grant in academic years 1994-95 and 1995-96.

Accomplishments/New Findings:

Dr. Tony Grange was supported by the ASSERT grant until his graduation in 1995, when he took a Postdoctoral position at the University of Conneticut Medical Center. Dr. Grange work on the topic of binaural pitch, sometimes called Huggins pitch. He showed that this pitch, while mediated by purely binaural comparisons behaved in many ways similar to traditionally derived monaural pitches. For instance, he showed that the one dichotic pitch can "mask" another pitch if the two have similar pitch values. But, he also showed that dichotic pitches were influenced by spectral energy in far removed spectral regions in ways that monaural pitches are not. He developed a cross-correlation model to account for many of these dichotic pitch data. In this model, there is a wideband prefilter which appears consistent with other studies of binaural processing.

Miss Sandra Guzman was supported by the ASSERT grant during the last year as a PhD student working on her doctoral degree in Psychology in the Parmly Hearing Institute of Loyola University Chicago. Miss Guzman is working on a project involving the localization of sound sources in reverberant environments, a topic often referred to as the precedence effect. Several recent investigators have shown that the ability of the auditory system to suppress acoustic information from reflected surfaces (echoes) is liable and depends on the listener's immediate prior exposure to the acoustic environment. A simple experiment demonstrates this effect. A train of brief stimuli are presented so that one sound in the train comes on from a loudspeaker as if this loudspeaker was the source of the sound. A few milliseconds later a second loudspeaker is presented the same sound as if this second loudspeaker produced an echo. Under the proper

conditions listeners only perceive the sound coming from the source loudspeaker indicating that the sound from the echo loudspeaker has been suppressed. If after presenting many such stimulus pairs in this train the location of the source and echo are reversed (that is, the loudspeaker that was presenting the echo now suddenly presents the first or source sound and vice a versa for the loudspeaker producing the echo), listeners immediately hear sounds from both loudspeakers indicating that echo suppression has ceased. After a few seconds, the listener again hears only one sound and it is at the location of the new source. Miss Guzman has developed a new procedure for studying these precedence effects. This new procedure allows her to study many echoes and the spatial relationships between the source and echoes. To date she has been developing and refining the procedure and she has shown that in general any change in the listener's acoustic environment which would not be plausible in a real world acoustic situation causes a temporary break down in echo suppression. This can occur for as many seven echoes.

Personnel Supported: Tony Grange, Ph Student earning his degree in 1995; Sandra Guzman, PhD Student

Publications (involving Tony Grange and Sandra Guzman and/or Dr. Yost):

1993

1. Yost, W.A., Fay, R.R., Popper, A.(Co-Editors), Psychoacoustics, Springer Verlag, 1993
2. Yost, William A. Overview of Psychoacoustics, in Psychoacoustics,(W.A. Yost, R.R. Fay, and A. Popper, eds), Springer Verlag, 1993
3. Yost, William A and Stanley Sheft. Auditory Perception, in Psychoacoustics, (W.A. Yost, R.R. Fay, and A. Popper, eds), Springer Verlag, 1993
4. Yost, William A. Perceptual Models of Localization, in Proceedings of Perception of Reproduced Sound, Audio Engineering Society, 12, 1993

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5. Yost, William A. Auditory Cognition, book review of Thinking in Sound, Science 263, 108-109, 1994
6. Yost, William A., New Developments in the Study of Spatial Hearing, Audiology Today 6, 9-12, 1994
7. Yost, William A and Sheft, Stanley. Modulation Detection Interference: Across-Spectral Processing and Sound Source Determnation, Hearing Research, 79 (1/2), 48-59, 1994
8. Dye, R.H., Yost, W.A., Stellmack, M, and Sheft. A Stimulus Classification Procedure for Assessing the Extent to Which Binaural Processing is Spectrally Analytic or Synthetic, Journal of the Acoustical Society of America 96, 2933-2947, 1994
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1995

10. Yost, William A., Pitch Strength and Modeling, Workshop on the Bilological Basis of Speech Processing, ATR Publications, Japan, 1.23, 57-65, 1995
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14. Yost, William A., and Shofner, William, Auditory Animal Psychophysics, Preceedings of the International Society for Psychophysics, Cassis, ISP publication, 1995

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15. Yost, William A., Patterson, R.D., and Sheft, S. A Time Domain Description for the Pitch Strength of Iterated Ripple Noise, Journal of the Acoustical Society of America 99, 1066-1078, 1996

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16. Dye, Raymond H, Jr., Stellmack, Mark, and Yost, William A., The effect of distractor frequency on judgments of target laterality based on interaural delays, Journal of the Acoustical Society of America
17. Yost, William A., Pitch of Iterated Rippled Noise, Journal of the Acoustical Society of America
18. Yost, William A. and Guzman, Sandra J. Sound Source Processing: Is There an Echo in Here?, Current Directions in Psychological Sciences
19. Yost, William A., Dye, R.H., and Sheft, S. A Simulated "Cocktail Party" With Up to Three Sound Sources, Perception and Psychophysics
20. Patterson, R.D., Handel, S., Yost, William A., Datta, J., The Relative Strength of Tone and Noise Components in Iterated Rippled Noise, Journal of the Acoustical Society of America,
21. Yost, William A., Pitch Strength of Iterated Rippled Noise, Journal of the Acoustical Society of America
22. Yost, William A. and Mead C. Killion, Mead, Quiet Absolute Thresholds, in Handbook of Acoustics (Malcom Crocker, Ed), John Wiley and Sons,
23. Yost, William A. and Sheft, S. Tonal Temporal Modulation Transfer Function, Auditory Neuroscience,
24. Yost, William A. The Cocktail Party Effect: 40 Years Later, in Localization (R. Gilkey and T. Anderson, eds) Erlbaum Press, New Jersey
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26. Yost, William A. Dan Mapes-Riordan, and Guzman, Sandra J. Relationship between Localization and the Franssen Effect, Journal of the Acoustical Society of America
27. Yost, William A. Pitch Strength of Iterated Rippled Noise when the Pitch is Ambiguous, Journal of the Acoustical Society of America
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Interactions/Transitions (involving Tony Grange and Sandra Guzman and/or Dr. Yost)

Meetings:

29. Grange, A.N. and Yost, William A., Effects of different samples of reproducible noise on detection of a 20-Hz wide interaural phase shift centered on 500 Hz, Journal of the

Acoustical Society of America 93, 2350, 1993

30. Yost, William A, Sheft, Stanley, Dye, Toby. Divided auditory attention with up to three sound sources: A Cocktail Party, Journal of the Acoustica Society of America 95, 2916, 1994
31. Yost, William A, Sheft, Stanley, Patterson, Roy. Iterated rippled noise: Testing temporal theories of complex pitch, Journal of the Acoustical Society of America 95, 2966, 1994
32. Sheft, Stanley and Yost, W.A. Reproducible noise discrimination with concurrent narrowband noises, Journal of the Acoustical Society of America 95, 2964,1994
33. Sheft, Stanley and Yost, W.A. Concurrent AM detection with two carriers. Journal of the Acoustical Society of America 96, 1995
34. Yost, William A. and Guzman, S.J. Precedence and Plausibility. Journal of the Acoustical Society of America 96, 1995
35. Yost, William A., Guzman, S.J, and Sheft, S. Pitch and the pitch strength of iterated ripple noise. Journal of the Acoustical Society of America 96, 1995
36. Guzman, S.J. and Yost, William A., Breakdown of echo suppression with mulitple echoes,Journal of the Acoustical Society of America 98, 29, 1995
37. Sheft, Stanley and Yost, William A., Temporal masking of amplitude modulation detection with a wideband carrier 98, 29, 1995
38. Yost, William A., Processing of log and linear ripple spectra, Journal of the Acoustical Society of America 98, 32, 1995
39. Yost, William A., Introduction to Acoustics and Psychophysics, Proceedings of the Marine Mammals Bioacoustics Short Course, Acoustical Society of America, 1995.
40. Yost, William A., Pitch Strength of Iterated Rippled Noise, Journal of the Acoustical Society of America 99, 2490, 1996.
41. Guzman, S. and Yost, William A., Journal of the Acoustical Society of America 99, 2516, 1996.
42. Mapes-Riordan, D., Guzman, S. and Yost, William A., Journal of the Acoustical Society of America 99, 2516, 1996.
43. Sheft, Stanley and Yost, William A., AM Detection with one- and two-tone modulators, Journal of the Acoustical Society of America 99, 2540, 1996.

Consultative: none by Tony Grange or Sandra Guzman *(William A. Yost, Science Advisory Board of the House Ear Institute, Los Angles)*

Transitions: none

Inventions/patents: NONE

Honors/Awards: none by Tony Grange or Sandra Guzman *(William A. Yost, Fellow American Speech Language and Hearing Association, 1995, William A. Yost, Fellow American Association for the Advancement of Sciences, 1996)*